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| Unit: Chemistry | Lesson | Topic: pH (Acid and Bases) |

Do Now: Copy homework. Answer this question in your notebook: How do you “filter” something?

Learning Target: I CAN create a filtration unit using what I know about pH and acids/bases

Essential Question: How do the properties and interactions of matter and energy explain physical and chemical change?

Standards Addressed:

New York City Middle School Science Standards: S1a, S5f, S6d, S7a, S7d

CCLS: RST.6-8.3, CCLS: RST.6-8.7, WHST.6-8.4

Performance Objectives:

Students will be able to (SWBAT):

1. Recall what they know about acids, bases, and pH
2. Develop and create a filtration unit that would modify pH levels to achieve goal
3. Compare the different levels of pH using indicators
4. Work with group members to conduct an experiment in order to gather and analyze data

Vocabulary:

*pH, indicator, acids, bases, litmus paper*

Material List: Laptop, baking soda, vinegar (“gray” water will be vinegar mixed with soil), pipets, calcium carbonate, soil, safety glasses, rough calcite stones, plastic cups with 5 holes on the bottom, jars to catch water, cheesecloth, trays, litmus paper, plastic cups, tap water, aquarium gravel, sand, activated, carbon/activated charcoal, marbles, cotton balls, coffee filters, well plates, universal indicator (optional)

Mini Lesson and Activity (Development of Lesson):

1. Before class- headings on board, date, agenda, homework written, computer set to board
2. MEET AND GREET STUDENTS
3. *(~5 min)* Put up the DO NOW, HW, and LT. Have PowerPoint ready and set up. Go over Do Now.
4. *(~10 min)* Review how you would know something is an acid or base. Review how to read litmus paper/universal indicator.
5. Discuss scenario with the students: Due to the continuous increase in pollution over the centuries, the amount of acid rain has increased and has become more acidic than before (pH of 4). The acid rain has entered into our water supply and the City is desperately trying to fix it. However, the City needs at least 1 week before the pH of the water supply is back to normal (pH of 7). You have no bottled water at home and have decided to take matters into your own hands…by developing your own filtration unit!

GOAL: The level of the acidic rainwater is too high (pH 4). Work with your group members to develop a filtration unit that would increase the pH (towards neutral pH 7, our goal). *How can we reuse water and why would this be important in other scenarios/situations?*

1. *(~20-25 min)* Activity: Students will work independently to draw out their own designs in their notebook. They will pick 4 items from the list of materials to use in their unit and how to layer them. In groups, they will discuss, explain their designs, and decide on a final design. Groups will create their filter design and then begin testing.

*Experiment/Testing:*

1. Have students create the Cleaning Water Filtering System (skeleton).
2. Fill the bottle with the first filtering material to a depth of 5–8 centimeters (cm).
3. Repeat for the 2nd, 3rd, and 4th filtering materials.
4. Obtain 350 ml of clean water.
5. Measure the pH of the water with litmus paper and compare it to the pH color chart. Collect data and record observations in notebook. This pH measurement will serve as the control and pH that students want to reach.
6. Run the clean water through the water filtering system (approximately 10-16 oz.).
7. Have students draw and label diagrams of the filtration system.
8. Once the clean water has gone through the water filtering system, replace the clear plastic cup with a new one.
9. Get 350 ml of vinegar and soil water mix. Students should observe the “gray water” first.
10. Measure the pH of the gray water with litmus paper and compare it to the pH color chart. Collect data and record observations.
11. Run the gray water through the water filtering system. Observe the properties of the water after it has been filtered once and record observations.
12. Measure the pH of the water with litmus paper and compare it to the pH color chart. Collect data and record observations.
13. Filter another 350 ml of gray water. While the gray water is running through the water filtering system, have students discuss what each layer in the filtration system was for (ideally and what it should have done).
14. Observe the properties of the water after it has been filtered for the second time.
15. Measure the pH of the water with litmus paper and compare it to the pH color chart. Collect data and record your observations on the Cleaning Water.
16. Repeat for a 3rd trial.
17. Students will compare the properties of their filtered water to the control (clean water) to determine if their gray water was “cleaned” by their filtering unit.

*7. (~5 min)* Summarizing/Share Out.

Differentiation:

Discussion prompts/sentence starters present, use of various diagrams/visual representations as well as the use of manipulatives (kinesthetic learning) alongside text

Evaluation/Assessment:

Students will be assessed based on the completion of their filtering unit. They will be graded on their class notes and a final lab report.

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| **CATEGORY** | **4 - Excellent** | **3 - Good** | **2 – Satisfactory/Passing** | **1 – Poor/Need Assistance** |
| **Contributions to Class or Group Discussions** | Often or always provides useful ideas when participating in the group and in classroom discussion. A leader who contributes a lot of effort. | Usually provides useful ideas when participating in the group and in classroom discussion. A strong group member who tries hard. | Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required. | Gives very little useful ideas when participating in the group and in classroom discussion. May not be participating in discussions at all or discusses something other than the main topic. |
| **Quality of Work** | Clear evidence of critical thinking (application, analysis, synthesis and evaluation). Work is done well. | Work is done well and is consistent. Some critical thinking. | Classwork is sometimes sloppy. Critical thinking is just beginning (needs more work). | Work is usually sloppy, incomplete, or off target. There is no critical thinking at all. |
| **Time-management** | Manages and makes use of time well so that things get done before time is up. | Usually uses time well but may lose a bit of focus at one point. Things get done on time. | Tends to not be focused, but gets things done by the deadlines. | Rarely gets things done by the deadlines often because student is unable to manage his/her time. |
| **Focusing on the Task** | Always stays focused on the task and what needs to be done. Very self-directed. | Focuses on the task and what needs to be done most of the time. | Focuses on the task and what needs to be done some of the time. Sometimes needs to be reminded to stay on-task. | Has trouble focusing on the task and what needs to be done. Lets others do the work. |
| **Working with Others** | Almost always listens to, shares with, and supports the work of others. Tries to keep people working well together. | Usually listens to, shares, with, and supports the work of others. Does not cause "bumps" in the group. | Sometimes listens to, shares with, and supports the efforts of others, but may not be a good team member by distracting others. | Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player. |
| **Science**  **Concepts** | Ready grasp of all science concepts. | Fairly sure grip on all science concepts. | Seems to understand most science concepts but occasionally shares misconceptions. | Clearly does not understand the science concepts in this unit. |

Rubric